

REMARKS

Summary

Claims 1, 2, 4, 7, 9, 10, 11, and 12 are currently amended. No new matter is added as a result. Claims 6 and 14 are canceled. Therefore, claims 1-5, 7-13, and 15-21 are currently pending.

Objections

The Examiner objected to claim 4 because it depended on itself. (Office Action, page 2). The claim has been amended to correct the error, as shown above. No new matter was added as a result.

35 U.S.C. § 102(b)

Claims 1, 3, 4, 12, and 13 were rejected pursuant to 35 U.S.C. § 102(b) as being anticipated by Jackson, et al. (U.S. Patent No. 6,193,660). Claims 2, 6, 7, 14, and 15 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson, et al. '660 in view of Von Behren, et al. (U.S. Patent Application Publication US 2005/0107704).

Independent claim 1 has been amended to recite the features of dependent claim 6. Independent claim 1 recites, *inter alia*, "displaying a breathing cycle waveform comprising the first portion." Jackson, et al. '660 does not teach displaying a breathing cycle waveform.

In regards to the obviousness analysis, the Examiner argues that this feature is disclosed in paragraphs 19 and 34 of Von Behren, et al. Paragraph 19 of Von Behren, et al. discloses a processor 14 that is operable to match a waveform to variations of an imaging parameter over a time period and determine phase and amplitude characteristics. Both paragraphs 19 and 34 of Von Behren, et al. disclose that the phase and amplitude information may be used to generate and display anatomical images. However, there is no teaching of displaying a breathing cycle waveform, let alone displaying any waveform. Also, Von Behren, et al. is referring to using

characteristics of a heart cycle, not a breathing cycle, to aid in generating anatomical images. There is no teaching of displaying a breathing cycle waveform.

Accordingly, claim 1 is allowable over Jackson, et al. '660 as well as Von Behren, et al.

Claims 3-5, and 9-11 depend, directly or indirectly, from allowable claim 1 and, therefore, are allowable for at least this reason.

Further limitations distinguish from Jackson, et al., resulting in claim 4 being allowable. Claim 4 recites, *inter alia*, "determining the motion parameter as a function of a plurality of local regions in the current frame of data relative to the reference frame of data." The Examiner argues that this feature is taught in column 7, lines 4-7 of Jackson, et al. '660. (Office Action, page 2). However, these lines state that a correlation value is determined for each of a plurality of relative positions. A plurality of relative positions is not the same as a plurality of local regions. There is no teaching of determining the motion parameter as a function of a plurality of local regions in the current frame of data relative to the reference frame of data.

Claim 17 recites features similar to claim 4 and, therefore, is allowable for at least the same reasons.

Independent claim 12 has been amended to recite the features of dependent claim 14. Independent claim 12 recites, *inter alia*, "a display operable to display a breathing cycle waveform." Jackson, et al. '660 does not teach this feature. Concerning the obviousness analysis, the same arguments in regards to the Von Behren, et al. reference for claim 1 apply here as well. Accordingly, claim 12 is allowable over Jackson, et al. '660 as well as Von Behren, et al. Claims 13 and 15 depend from currently amended and allowable claim 12 and, therefore, are allowable for at least this reason.

35 U.S.C. § 103(a)

Claims 2, 6, 7, 14, and 15 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson, et al. '660 in view of Von Behren, et al.

Claims 6 and 14 have been canceled. Their features have been implemented into claims 1 and 12, respectively. For the sake of clarity, the analysis for those features has been discussed above.

Independent claim 2 recites, *inter alia*, "obtaining ultrasound data acquired over a period of time and responsive to contrast agents." The Examiner argues that this feature is taught in paragraph 22 of Von Behren, et al. (Office Action, page 4). Paragraph 22 states that data is acquired for spatial locations; in one embodiment, the data acquired is ultrasound data, such as B-mode or intensity data, and in another alternative embodiment, contrast agent data may be used. However, Von Behren, et al. concerns phase and amplitude analysis based on a heart cycle, not a breathing cycle. (Von Behren, et al., Abstract, paragraphs 16 and 21). Contrast agent imaging is used in regards to the circulatory system; *i.e.*, the heart cycle, not a breathing cycle. Contrast agents were specifically developed in order to be injected into the circulatory system. There is no motivation or suggestion to combine the teaching of contrast agent data of Von Behren, et al. with Jackson, et al. '660 in regards to determining a portion of a breathing cycle as a function of the ultrasound data. Accordingly, the *prima facie* case of obviousness has not been met and claim 2 is allowable.

Independent claim 7 recites, *inter alia*, "identifying the first portion as a function of a trend in the breathing cycle." The Examiner argues that this feature is taught in paragraphs 25-26 of Von Behren, et al. (Office Action, page 4). First, paragraphs 25-26 of Von Behren, et al. refer to a heart cycle, not a breathing cycle. Second, paragraphs 25-26 of Von Behren, et al. disclose a B-mode variation as a function of time over about two heart cycles and a time intensity curve represented as a Fourier series, but there is no teaching of identifying a portion of the cycle, let alone identifying a portion as a function of a trend in a breathing cycle. B-mode variation over time does not disclose identifying a portion. Also, there is no disclosure of identifying anything as a function of a trend. Therefore, the *prima facie* case of obviousness has not been met and claim 7 is allowable. Claim 8 depends from allowable claim 7 and, therefore, is allowable for at least this reason.

Claims 15 and 20 recite features substantially similar to claim 7 and, therefore, are allowable for the same reasons given for claim 7.

Claim 5 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson, et al. '660 in view of Jackson, et al. (U.S. Patent Application Publication U.S. 2005/0096543).

Claim 5 depends from allowable claim 1 and, therefore, is allowable for at least this reason.

Claim 8 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson, et al. '660 in view of Von Behren, et al., and in further view of Sui, et al. (U.S. Patent Application Publication U.S. 2005/0203395).

As mentioned above, claim 8 depends from allowable claim 7 and, therefore, is allowable for at least this reason. Also, claim 8 recites, *inter alia*, "identifying one of a peak and minimum of the breathing cycle." The Examiner argues that claim 21 of Sui, et al. discloses this feature. (Office Action, page 6). However, Sui, et al. refers to a heart cycle, not a breathing cycle. (Sui, et al., paragraph 31 and Fig. 4). Therefore, there is no teaching of identifying a peak or a minimum of a breathing cycle.

Claims 9, 10, 16, 17, 20, and 21 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson, et al. (U.S. Patent No. 6,673,017).

As mentioned above, dependent claim 9 depends from allowable claim 1 and, therefore, is allowable for at least this reason. Also, claim 9 recites, *inter alia*, "identifying reoccurrence of the first portion of the breathing cycle." The Examiner argues that Jackson, et al. '017 discloses this feature in column 5, lines 53-67. (Office Action, page 7). However, column 5, lines 53-67 refer to temporal position of frames relative to a base physiological cycle. There is no teaching of identifying a reoccurrence of a certain portion of a breathing cycle.

As mentioned above, dependent claim 10 depends from allowable claim 1 and, therefore, is allowable for at least this reason. Also, claim 10 recites, *inter alia*, "repeating determining at least a first portion of a breathing cycle as a function of the ultrasound data for each cycle of the breathing cycle with a different reference frame for each breathing cycle." The Examiner argues that this is taught in column 6, lines 10-13 of Jackson, et al. '017. (Office Action, page 8). However, column 6, lines 10-13 of Jackson, et al. '017 states that offsets are determined relative to a beginning or end of the cycle, as a position along a time axis with reference to another frame, but there is no teaching of using a different reference frame for each breathing cycle nor a determination of a portion of a breathing cycle.

Independent claim 16 recites, *inter alia*, "resetting the reference frame of data for each of the plurality of subsequent cycles as a first frame of ultrasound data corresponding to the first portion of the cycle." As mentioned in conjunction with claim 10, Jackson, et al. '017 does not teach resetting the reference frame of data for each subsequent cycle, let alone resetting the reference frame as a first frame of ultrasound data. Therefore, the prima facie case of obviousness has not been met and claim 16 is allowable. Claims 17-21 depend from allowable claim 16 and, therefore, are allowable for at least this reason.

Claims 11 and 19 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson, et al. '017 and in further view of Jago, et al. (U.S. Patent No. 6,117,081).

Claims 11 and 19 depend from allowable claims 1 and 16, respectively, and, therefore, are allowable for at least this reason. Also, claims 11 and 19 relate to morphing ultrasound data frames, and the Examiner argues that this feature is taught in column 5, lines 12-33 of Jago, et al. (Office Action, page 11). However, there is no motivation to combine Jago, et al. with the other references because Jago, et al. deals with spatial compounding. (Jago, et al., column 1, lines 15-27). Spatial compound imaging is performed by rapidly acquiring a series of partially overlapping component image frames from independent spatial directions (Jago, et al., column 1, lines 15-27),

but the other references are interested in minimizing motions or correcting for motions while imaging from one position, not rapidly acquiring images at different angles.

Claim 18 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson, et al. '017 and in further view of Jackson, et al. '543.

Claim 18 depends from allowable claim 16 and, therefore, is allowable for at least this reason.

CONCLUSION:

Applicant respectfully submits that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 694-5810 or Craig Summerfield at (312) 321-4726.

PLEASE MAIL CORRESPONDENCE
TO:

Siemens Corporation
Customer No. 28524
Attn: Elsa Keller, Legal Administrator
170 Wood Avenue South
Iselin, NJ 08830

Respectfully submitted,



Anand Sethuraman, Reg. No. 43,351

Attorney(s) for Applicant(s)

Telephone: 650-943-7554

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